

NODE=M014

$f_0(500)$ or σ
was $f_0(600)$

$$I^G(JPC) = 0^+(0^{++})$$

A REVIEW GOES HERE – Check our WWW List of Reviews

NODE=M014

$f_0(500)$ T-MATRIX POLE \sqrt{s}

Note that $\Gamma \approx 2 \operatorname{Im}(\sqrt{s}_{\text{pole}})$.

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
(400–550)–i(200–350) OUR ESTIMATE			
• • • We do not use the following data for averages, fits, limits, etc. • • •			
(440 ± 10)–i(238 ± 10)	1 ALBALADEJO 12	RVUE	Compilation
(445 ± 25)–i(278 ⁺²² ₋₁₈)	2,3 GARCIA-MAR..11	RVUE	Compilation
(457 ⁺¹⁴ ₋₁₃)–i(279 ⁺¹¹ ₋₇)	2,4 GARCIA-MAR..11	RVUE	Compilation
(442 ⁺⁵ ₋₈)–i(274 ⁺⁶ ₋₅)	5 MOUSSALLAM11	RVUE	Compilation
(452 ± 13)–i(259 ± 16)	6 MENNESSIER 10	RVUE	Compilation
(448 ± 43)–i(266 ± 43)	7 MENNESSIER 10	RVUE	Compilation
(455 ± 6 ⁺³¹ ₋₁₃)–i(278 ± 6 ⁺³⁴ ₋₄₃)	8 CAPRINI 08	RVUE	Compilation
(463 ± 6 ⁺³¹ ₋₁₇)–i(259 ± 6 ⁺³³ ₋₃₄)	9 CAPRINI 08	RVUE	Compilation
(552 ⁺⁸⁴ ₋₁₀₆)–i(232 ⁺⁸¹ ₋₇₂)	10 ABLIKIM 07A	BES2	$\psi(2S) \rightarrow \pi^+ \pi^- J/\psi$
(466 ± 18)–i(223 ± 28)	11 BONVICINI 07	CLEO	$D^+ \rightarrow \pi^- \pi^+ \pi^+$
(472 ± 30)–i(271 ± 30)	12 BUGG 07A	RVUE	Compilation
(484 ± 17)–i(255 ± 10)	GARCIA-MAR..07	RVUE	Compilation
(430)–i(325)	13 ANISOVICH 06	RVUE	Compilation
(441 ⁺¹⁶ ₋₈)–i(272 ⁺⁹ _{-12.5})	14 CAPRINI 06	RVUE	$\pi\pi \rightarrow \pi\pi$
(470 ± 50)–i(285 ± 25)	15 ZHOU 05	RVUE	
(541 ± 39)–i(252 ± 42)	16 ABLIKIM 04A	BES2	$J/\psi \rightarrow \omega \pi^+ \pi^-$
(528 ± 32)–i(207 ± 23)	17 GALLEGOS 04	RVUE	Compilation
(440 ± 8)–i(212 ± 15)	18 PELAEZ 04A	RVUE	$\pi\pi \rightarrow \pi\pi$
(533 ± 25)–i(249 ± 25)	19 BUGG 03	RVUE	
517 – i240	BLACK 01	RVUE	$\pi^0 \pi^0 \rightarrow \pi^0 \pi^0$
(470 ± 30)–i(295 ± 20)	14 COLANGELO 01	RVUE	$\pi\pi \rightarrow \pi\pi$
(535 ⁺⁴⁸ ₋₃₆)–i(155 ⁺⁷⁶ ₋₅₃)	20 ISHIDA 01		$\Upsilon(3S) \rightarrow \Upsilon \pi\pi$
610 ± 14 – i620 ± 26	21 SUROVTSEV 01	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
(540 ⁺³⁶ ₋₂₉)–i(193 ⁺³² ₋₄₀)	ISHIDA 00B		$p\bar{p} \rightarrow \pi^0 \pi^0 \pi^0$
445 – i235	HANNAH 99	RVUE	π scalar form factor
(523 ± 12)–i(259 ± 7)	KAMINSKI 99	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, \sigma\sigma$
442 – i 227	OLLER 99	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
469 – i203	OLLER 99B	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
445 – i221	99C	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, \eta\eta$
(1530 ⁺⁹⁰ ₋₂₅₀)–i(560 ± 40)	ANISOVICH 98B	RVUE	Compilation
420 – i 212	LOCHER 98	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
440 – i245	22 DOBADO 97	RVUE	Compilation
(602 ± 26)–i(196 ± 27)	23 ISHIDA 97		$\pi\pi \rightarrow \pi\pi$
(537 ± 20)–i(250 ± 17)	24 KAMINSKI 97B	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, 4\pi$
470 – i250	25,26 TORNQVIST 96	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, K\pi, \eta\pi$
387 – i305	26,27 JANSSEN 95	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
420 – i370	28 ACHASOV 94	RVUE	$\pi\pi \rightarrow \pi\pi$
(506 ± 10)–i(247 ± 3)	KAMINSKI 94	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
370 – i356	29 ZOU 94B	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
408 – i342	26,29 ZOU 93	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
470 – i208	30 VANBEVEREN 86	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, \eta\eta$
(750 ± 50)–i(450 ± 50)	31 ESTABROOKS 79	RVUE	...
(660 ± 100)–i(320 ± 70)	PROTOPOP... 73	HBC	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
650 – i370	32 BASDEVANT 72	RVUE	$\pi\pi \rightarrow \pi\pi$

¹ Applying the chiral unitary approach at NLO to the K_{e4} data of BATLEY 10 and $\pi N \rightarrow \pi\pi N$ data of HYAMS 73, GRAYER 74, and PROTOPOPOV 73.

² Uses the K_{e4} data of BATLEY 10C and the $\pi N \rightarrow \pi\pi N$ data of HYAMS 73, GRAYER 74, and PROTOPOPOV 73.

³ Analytic continuation using Roy equations.

⁴ Analytic continuation using GKPY equations.

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- 5 Using Roy equations.
 6 Average of three variants of the analytic K-matrix model. Uses the K_{e4} data of BATLEY 08A and the $\pi N \rightarrow \pi\pi N$ data of HYAMS 73 and GRAYER 74.
 7 Average of the analyses of three data sets in the K-matrix model. Uses the data of BATLEY 08A, HYAMS 73, and GRAYER 74, partially of COHEN 80 or ETKIN 82B.
 8 From the K_{e4} data of BATLEY 08A and $\pi N \rightarrow \pi\pi N$ data of HYAMS 73.
 9 From the K_{e4} data of BATLEY 08A and $\pi N \rightarrow \pi\pi N$ data of PROTOPOPESCU 73, GRAYER 74, and ESTABROOKS 74.
 10 From a mean of three different $f_0(500)$ parametrizations. Uses 40k events.
 11 From an isobar model using 2.6k events.
 12 Reanalysis of ABLIKIM 04A, PISLAK 01, and HYAMS 73 data.
 13 Using the N/D method.
 14 From the solution of the Roy equation (ROY 71) for the isoscalar S-wave and using a phase-shift analysis of HYAMS 73 and PROTOPOPESCU 73 data.
 15 Reanalysis of the data from PROTOPOPESCU 73, ESTABROOKS 74, GRAYER 74, ROSSELET 77, PISLAK 03, and AKHMETSHIN 04.
 16 From a mean of six different analyses and $f_0(500)$ parameterizations.
 17 Using data on $\psi(2S) \rightarrow J/\psi\pi\pi$ from BAI 00E and on $\Upsilon(nS) \rightarrow \Upsilon(mS)\pi\pi$ from BUTLER 94B and ALEXANDER 98.
 18 Reanalysis of data from PROTOPOPESCU 73, ESTABROOKS 74, GRAYER 74, and COHEN 80 in the unitarized ChPT model.
 19 From a combined analysis of HYAMS 73, AUGUSTIN 89, AITALA 01B, and PISLAK 01.
 20 A similar analysis (KOMADA 01) finds $(580^{+79}_{-30}) - i(190^{+107}_{-49})$ MeV.
 21 Coupled channel reanalysis of BATON 70, BENSINGER 71, BAILLON 72, HYAMS 73, HYAMS 75, ROSSELET 77, COHEN 80, and ETKIN 82B using the uniformizing variable.
 22 Using the inverse amplitude method and data of ESTABROOKS 73, GRAYER 74, and PROTOPOPESCU 73.
 23 Reanalysis of data from HYAMS 73, GRAYER 74, SRINIVASAN 75, and ROSSELET 77 using the interfering amplitude method.
 24 Average and spread of 4 variants ("up" and "down") of KAMINSKI 97B 3-channel model.
 25 Uses data from BEIER 72B, OCHS 73, HYAMS 73, GRAYER 74, ROSSELET 77, CASON 83, ASTON 88, and ARMSTRONG 91B. Coupled channel analysis with flavor symmetry and all light two-pseudoscalars systems.
 26 Demonstrates explicitly that $f_0(500)$ and $f_0(1370)$ are two different poles.
 27 Analysis of data from FALVARD 88.
 28 Analysis of data from OCHS 73, ESTABROOKS 75, ROSSELET 77, and MUKHIN 80.
 29 Analysis of data from OCHS 73, GRAYER 74, and ROSSELET 77.
 30 Coupled-channel analysis using data from PROTOPOPESCU 73, HYAMS 73, HYAMS 75, GRAYER 74, ESTABROOKS 74, ESTABROOKS 75, FROGGATT 77, CORDEN 79, BISWAS 81.
 31 Analysis of data from APEL 73, GRAYER 74, CASON 76, PAWLICKI 77. Includes spread and errors of 4 solutions.
 32 Analysis of data from BATON 70, BENSINGER 71, COLTON 71, BAILLON 72, PROTOPOPESCU 73, and WALKER 67.

$f_0(500)$ BREIT-WIGNER MASS OR K-MATRIX POLE PARAMETERS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
(400-550) OUR ESTIMATE			
• • • We do not use the following data for averages, fits, limits, etc. • • •			
513±32	33 MURAMATSU 02	CLEO	$e^+ e^- \approx 10$ GeV
478 ⁺²⁴ ₋₂₃ ±17	AITALA 01B	E791	$D^+ \rightarrow \pi^- \pi^+ \pi^+$
563 ⁺⁵⁸ ₋₂₉	34 ISHIDA 01		$\Upsilon(3S) \rightarrow \Upsilon\pi\pi$
555	35 ASNER 00	CLE2	$\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$
540±36	ISHIDA 00B		$p\bar{p} \rightarrow \pi^0 \pi^0 \pi^0$
750± 4	ALEKSEEV 99	SPEC	$1.78 \pi^- p_{\text{polar}} \rightarrow \pi^- \pi^+ n$
744± 5	ALEKSEEV 98	SPEC	$1.78 \pi^- p_{\text{polar}} \rightarrow \pi^- \pi^+ n$
759± 5	36 TROYAN 98		$5.2 np \rightarrow np\pi^+\pi^-$
780±30	ALDE 97	GAM2	$450 pp \rightarrow pp\pi^0\pi^0$
585±20	37 ISHIDA 97		$\pi\pi \rightarrow \pi\pi$
761±12	38 SVEC 96	RVUE	$6-17 \pi N_{\text{polar}} \rightarrow \pi^+ \pi^- N$
~ 860	39,40 TORNQVIST 96	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, K\pi, \eta\pi$
1165±50	41,42 ANISOVICH 95	RVUE	$\pi^- p \rightarrow \pi^0 \pi^0 n, \bar{p}p \rightarrow \pi^0 \pi^0 \pi^0, \pi^0 \pi^0 \eta, \pi^0 \eta\eta$
~ 1000	43 ACHASOV 94	RVUE	$\pi\pi \rightarrow \pi\pi$
414±20	38 AUGUSTIN 89	DM2	

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 → UNCHECKED ←

- ³³ Statistical uncertainty only.
- ³⁴ A similar analysis (KOMADA 01) finds 526^{+48}_{-37} MeV.
- ³⁵ From the best fit of the Dalitz plot.
- ³⁶ 6σ effect, no PWA.
- ³⁷ Reanalysis of data from HYAMS 73, GRAYER 74, SRINIVASAN 75, and ROSSELET 77 using the interfering amplitude method.
- ³⁸ Breit-Wigner fit to S-wave intensity measured in $\pi N \rightarrow \pi^- \pi^+ N$ on polarized targets. The fit does not include $f_0(980)$.
- ³⁹ Uses data from ASTON 88, OCHS 73, HYAMS 73, ARMSTRONG 91B, GRAYER 74, CASON 83, ROSSELET 77, and BEIER 72B. Coupled channel analysis with flavor symmetry and all light two-pseudoscalars systems.
- ⁴⁰ Also observed by ASNER 00 in $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$ decays.
- ⁴¹ Uses $\pi^0 \pi^0$ data from ANISOVICH 94, AMSLER 94D, and ALDE 95B, $\pi^+ \pi^-$ data from OCHS 73, GRAYER 74 and ROSSELET 77, and $\eta \eta$ data from ANISOVICH 94.
- ⁴² The pole is on Sheet III. Demonstrates explicitly that $f_0(500)$ and $f_0(1370)$ are two different poles.
- ⁴³ Analysis of data from OCHS 73, ESTABROOKS 75, ROSSELET 77, and MUKHIN 80.

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VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
(400–700) OUR ESTIMATE			
• • • We do not use the following data for averages, fits, limits, etc. • • •			
335 ± 67	⁴⁴ MURAMATSU 02	CLEO	$e^+ e^- \approx 10$ GeV
$324^{+42}_{-40} \pm 21$	AITALA	01B	$E791$ $D^+ \rightarrow \pi^- \pi^+ \pi^+$
372^{+229}_{-95}	⁴⁵ ISHIDA	01	$\gamma(3S) \rightarrow \gamma \pi \pi$
540	⁴⁶ ASNER	00	CLE2 $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$
372 ± 80	ISHIDA	00B	$p\bar{p} \rightarrow \pi^0 \pi^0 \pi^0$
119 ± 13	ALEKSEEV	99	SPEC $1.78 \pi^- p_{\text{polar}} \rightarrow \pi^- \pi^+ n$
77 ± 22	ALEKSEEV	98	SPEC $1.78 \pi^- p_{\text{polar}} \rightarrow \pi^- \pi^+ n$
35 ± 12	⁴⁷ TROYAN	98	$5.2 np \rightarrow np \pi^+ \pi^-$
780 ± 60	ALDE	97	GAM2 $450 pp \rightarrow pp \pi^0 \pi^0$
385 ± 70	⁴⁸ ISHIDA	97	$\pi \pi \rightarrow \pi \pi$
290 ± 54	⁴⁹ SVEC	96	RVUE $6-17 \pi N_{\text{polar}} \rightarrow \pi^+ \pi^- N$
~ 880	50,51 TORNQVIST	96	RVUE $\pi \pi \rightarrow \pi \pi, K\bar{K}, K\pi, \eta \pi$
460 ± 40	52,53 ANISOVICH	95	RVUE $\pi^- p \rightarrow \pi^0 \pi^0 n, \bar{p}p \rightarrow \pi^0 \pi^0 \pi^0, \pi^0 \pi^0 \eta, \pi^0 \eta \eta$
~ 3200	⁵⁴ ACHASOV	94	RVUE $\pi \pi \rightarrow \pi \pi$
494 ± 58	⁴⁹ AUGUSTIN	89	DM2

- ⁴⁴ Statistical uncertainty only.
- ⁴⁵ A similar analysis (KOMADA 01) finds 301^{+145}_{-100} MeV.
- ⁴⁶ From the best fit of the Dalitz plot.
- ⁴⁷ 6σ effect, no PWA.
- ⁴⁸ Reanalysis of data from HYAMS 73, GRAYER 74, SRINIVASAN 75, and ROSSELET 77 using the interfering amplitude method.
- ⁴⁹ Breit-Wigner fit to S-wave intensity measured in $\pi N \rightarrow \pi^- \pi^+ N$ on polarized targets. The fit does not include $f_0(980)$.
- ⁵⁰ Uses data from ASTON 88, OCHS 73, HYAMS 73, ARMSTRONG 91B, GRAYER 74, CASON 83, ROSSELET 77, and BEIER 72B. Coupled channel analysis with flavor symmetry and all light two-pseudoscalars systems.
- ⁵¹ Also observed by ASNER 00 in $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$ decays.
- ⁵² Uses $\pi^0 \pi^0$ data from ANISOVICH 94, AMSLER 94D, and ALDE 95B, $\pi^+ \pi^-$ data from OCHS 73, GRAYER 74 and ROSSELET 77, and $\eta \eta$ data from ANISOVICH 94.
- ⁵³ The pole is on Sheet III. Demonstrates explicitly that $f_0(500)$ and $f_0(1370)$ are two different poles.
- ⁵⁴ Analysis of data from OCHS 73, ESTABROOKS 75, ROSSELET 77, and MUKHIN 80.

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Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \quad \pi \pi$	dominant
$\Gamma_2 \quad \gamma \gamma$	seen

DESIG=1;OUR EST;→ UNCHECKED ←
 DESIG=5;OUR EST;→ UNCHECKED ←

$f_0(500)$ PARTIAL WIDTHS

$\Gamma(\gamma\gamma)$

VALUE (keV)

DOCUMENT ID

TECN COMMENT

Γ_2

• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.7 ± 0.4	55	HOFERICHTER11	RVUE	Compilation
3.08±0.82	56	MENNESSIER 11	RVUE	Compilation
2.08±0.2 $^{+0.07}_{-0.04}$	57	MOUSSALLAM11	RVUE	Compilation
2.08	58	MAO 09	RVUE	Compilation
1.2 ± 0.4	59	BERNABEU 08	RVUE	
3.9 ± 0.6	56	MENNESSIER 08	RVUE	$\gamma\gamma \rightarrow \pi^+\pi^-, \pi^0\pi^0$
1.8 ± 0.4	60	OLLER 08	RVUE	Compilation
1.68±0.15	60,61	OLLER 08A	RVUE	Compilation
3.1 ± 0.5	62,63	PENNINGTON 08	RVUE	Compilation
2.4 ± 0.4	63,64	PENNINGTON 08	RVUE	Compilation
4.1 ± 0.3	65	PENNINGTON 06	RVUE	$\gamma\gamma \rightarrow \pi^0\pi^0$
3.8 ± 1.5	66,67	BOGLIONE 99	RVUE	$\gamma\gamma \rightarrow \pi^+\pi^-, \pi^0\pi^0$
5.4 ± 2.3	66	MORGAN 90	RVUE	$\gamma\gamma \rightarrow \pi^+\pi^-, \pi^0\pi^0$
10 ± 6	COURAU 86	DM1	$e^+e^- \rightarrow \pi^+\pi^- e^+e^-$	
55	Using Roy-Steiner equations with $\pi\pi$ phase shifts from an update of COLANGELO 01 and from GARCIA-MARTIN 11A.			
56	Using an analytic K-matrix model.			
57	Using dispersion integral with phase input from Roy equations and data from MARSISKE 90, BOYER 90, BEHREND 92, UEHARA 08A, and MORI 07.			
58	Used dispersion theory. The value quoted used the $f_0(500)$ pole position of 457 – i276 MeV.			
59	Using p, n polarizabilities from PDG 06 and fitting to $\pi\pi$ phase motion from GARCIA-MARTIN 07 and σ -poles from GARCIA-MARTIN 07 and CAPRINI 06.			
60	Using twice-subtracted dispersion integrals.			
61	Supersedes OLLER 08.			
62	Solution A (preferred solution based on χ^2 -analysis).			
63	Dispersion theory based amplitude analysis of BOYER 90, MARSISKE 90, BEHREND 92, and MORI 07.			
64	Solution B (worse than solution A; still acceptable when systematic uncertainties are included).			
65	Using unitarity and the σ pole position from CAPRINI 06.			
66	This width could equally well be assigned to the $f_0(1370)$. The authors analyse data from BOYER 90 and MARSISKE 90 and report strong correlation with $\gamma\gamma$ width of $f_2(1270)$.			
67	Supersedes MORGAN 90.			

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REFID=48314

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$f_0(500)$ REFERENCES

ALBALADEJO 12	PR D86 034003	M. Albaladejo, J.A. Oller	(MURC)
GARCIA-MAR... 11	PRL 107 072001	R. Garcia-Martin <i>et al.</i>	(MADR, CRAC)
GARCIA-MAR... 11A	PR D83 074004	R. Garcia-Martin <i>et al.</i>	(MADR, CRAC)
HOFERICHTER 11	EPJ C71 1743	M. Hoferichter, D.R. Phillips, C. Schat	(BONN+)
MENNESSIER 11	PL B696 40	G. Mennessier, S. Narison, X.-G. Wang	
MOUSSALLAM 11	EPJ C71 1814	B. Moussallam	
BATLEY 10	PL B686 101	J.R. Batley <i>et al.</i>	(CERN NA48/2 Collab.)
BATLEY 10C	EPJ C70 635	J.R. Batley <i>et al.</i>	(CERN NA48/2 Collab.)
MENNESSIER 10	PL B688 59	G. Mennessier, S. Narison, X.-G. Wang	
MAO 09	PR D79 116008	Y. Mao <i>et al.</i>	
BATLEY 08A	EPJ C54 411	J.R. Batley <i>et al.</i>	(CERN NA48/2 Collab.)
BERNABEU 08	PR1 100 241804	J. Bernabeu, J. Prades	(IFIC, GRAN)
CAPRINI 08	PR D77 114019	I. Caprini	
MENNESSIER 08	PL B665 205	G. Mennessier, S. Narison, W. Ochs	
OLLER 08	PL B659 201	J.A. Oller, L. Roca, C. Schat	(MURC, UBA)
OLLER 08A	EPJ A37 15	J.A. Oller, L. Roca	(MURC)
PENNINGTON 08	EPJ C56 1	M.R. Pennington <i>et al.</i>	
UEHARA 08A	PR D78 052004	S. Uehara <i>et al.</i>	(BELLE Collab.)
ABLIKIM 07A	PL B645 19	M. Ablikim <i>et al.</i>	(BES Collab.)
BONVICINI 07	PR D76 012001	G. Bonvicini <i>et al.</i>	(CLEO Collab.)
BUGG 07A	JPG 34 151	D.V. Bugg <i>et al.</i>	
GARCIA-MAR... 07	PR D76 074034	R. Garcia-Martin, J.R. Pelaez, F.J. Yndurain	
MORI 07	PR D75 051101	T. Mori <i>et al.</i>	(BELLE Collab.)
ANISOVICH 06	IJMP A21 3615	V.V. Anisovich	
CAPRINI 06	PRL 96 132001	I. Caprini, G. Colangelo, H. Leutwyler	(BCIP+)
PDG 06	JPG 33 1	W.-M. Yao <i>et al.</i>	(PDG Collab.)
PENNINGTON 06	PRL 97 011601	M.R. Pennington	
ZHOU 05	JHEP 0502 043	Z.Y. Zhou <i>et al.</i>	
ABLIKIM 04A	PL B598 149	M. Ablikim <i>et al.</i>	(BES Collab.)
AKHMETSHIN 04	PL B578 285	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
GALLEGOS 04	PR D69 074033	A. Gallegos <i>et al.</i>	
PELAEZ 04A	MPL A19 2879	J.R. Pelaez	
BUGG 03	PL B572 1	D.V. Bugg	
PISLAK 03	PR D67 072004	S. Pislak <i>et al.</i>	(BNL E865 Collab.)
Also PR D81 11903E		S. Pislak <i>et al.</i>	(BNL E865 Collab.)
MURAMATSU 02	PRL 89 251802	H. Muramatsu <i>et al.</i>	(CLEO Collab.)
Also PRL 90 059901 (errat)		H. Muramatsu <i>et al.</i>	(CLEO Collab.)
AITALA 01B	PRL 86 770	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
BLACK 01	PR D64 014031	D. Black <i>et al.</i>	
COLANGELO 01	NP B603 125	G. Colangelo, J. Gasser, H. Leytwyler	

ISHIDA	01	PL B518 47	M. Ishida <i>et al.</i>	REFID=48354
KOMADA	01	PL B508 31	T. Komada <i>et al.</i>	REFID=48541
PISLAK	01	PRL 87 221801	S. Pislak <i>et al.</i>	(BNL E865 Collab.) REFID=48433
Also		PR D67 072004	S. Pislak <i>et al.</i>	(BNL E865 Collab.) REFID=49344
Also		PRL 105 019901E	S. Pislak <i>et al.</i>	(BNL E865 Collab.) REFID=53338
SUROVTSEV	01	PR D63 054024	Y.S. Surovtsev, D. Krupa, M. Nagy	REFID=48310
ASNER	00	PR D61 012002	D.M. Asner <i>et al.</i>	(CLEO Collab.) REFID=47339
BAI	00E	PR D62 032002	J. Bai <i>et al.</i>	(BES Collab.) REFID=47955
ISHIDA	00B	PTP 104 203	M. Ishida <i>et al.</i>	REFID=48358
ALEKSEEV	99	NP B541 3	I.G. Alekseev <i>et al.</i>	REFID=46614
BOGLIONE	99	EPJ C9 11	M. Boglione, M.R. Pennington	REFID=46931
HANNAH	99	PR D60 017502	T. Hannah	REFID=46935
KAMINSKI	99	EPJ C9 141	R. Kaminski, L. Lesniak, B. Loiseau	(CRAC, PARIN) REFID=46927
OLLER	99	PR D60 099906 (erratum)	J.A. Oller <i>et al.</i>	REFID=46899
OLLER	99B	NP A652 407 (erratum)	J.A. Oller, E. Oset	REFID=46924
OLLER	99C	PR D60 074023	J.A. Oller, E. Oset	REFID=47386
ALEKSEEV	98	PAN 61 174	I.G. Alekseev <i>et al.</i>	REFID=46328
ALEXANDER	98	PR D58 052004	J.P. Alexander <i>et al.</i>	(CLEO Collab.) REFID=46329
ANISOVICH	98B	SPU 41 419	V.V. Anisovich <i>et al.</i>	REFID=46331
		Translated from UFN 168 481.		
LOCHER	98	EPJ C4 317	M.P. Locher <i>et al.</i>	(PSI) REFID=46372
TROYAN	98	JINRRC 5-91 33	Yu. Troyan <i>et al.</i>	REFID=46615
ALDE	97	PL B397 350	D.M. Alde <i>et al.</i>	(GAMS Collab.) REFID=45392
DOBADO	97	PR D56 3057	A. Dobado, J.R. Pelaez	REFID=53964
ISHIDA	97	PTP 98 1005	S. Ishida <i>et al.</i>	(TOKY, MIYA, KEK) REFID=45998
KAMINSKI	97B	PL B413 130	R. Kaminski, L. Lesniak, B. Loiseau	(CRAC, IPN) REFID=45778
Also		PTP 95 745	S. Ishida <i>et al.</i>	(TOKY, MIYA, KEK) REFID=45770
SVEC	96	PR D53 2343	M. Svec	(MCGI) REFID=44509
TORNQVIST	96	PRL 76 1575	N.A. Tornqvist, M. Roos	(HELS) REFID=44507
ALDE	95B	ZPHY C66 375	D.M. Alde <i>et al.</i>	(GAMS Collab.) REFID=44375
ANISOVICH	95	PL B355 363	V.V. Anisovich <i>et al.</i>	(PNPI, SERP) REFID=44442
JANSSEN	95	PR D52 2690	G. Janssen <i>et al.</i>	(STON, ADLD, JULI) REFID=44508
ACHASOV	94	PR D49 5779	N.N. Achasov, G.N. Shestakov	(NOVM) REFID=44087
AMSLER	94D	PL B333 277	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.) REFID=44093
ANISOVICH	94	PL B323 233	V.V. Anisovich <i>et al.</i>	(Crystal Barrel Collab.) REFID=43659
BUTTLER	94B	PR D49 40	F. Butler <i>et al.</i>	(CLEO Collab.) REFID=43799
KAMINSKI	94	PR D50 3145	R. Kaminski, L. Lesniak, J.P. Maillet	(CRAC+) REFID=45771
ZOU	94B	PR D50 591	B.S. Zou, D.V. Bugg	(LOQM) REFID=44072
ZOU	93	PR D48 R3948	B.S. Zou, D.V. Bugg	(LOQM) REFID=43672
BEHREND	92	ZPHY C56 381	H.J. Behrend	(CELLO Collab.) REFID=43172
ARMSTRONG	91B	ZPHY C52 389	T.A. Armstrong <i>et al.</i>	(ATHU, BARI, BIRM+) REFID=41862
BOYER	90	PR D42 1350	J. Boyer <i>et al.</i>	(Mark II Collab.) REFID=41362
MARSICKI	90	PR D41 3324	H. Marsicki <i>et al.</i>	(Crystal Ball Collab.) REFID=41351
MORGAN	90	ZPHY C48 623	D. Morgan, M.R. Pennington	(RAL, DURH) REFID=41583
AUGUSTIN	89	NP B320 1	J.E. Augustin, G. Cosme	(DM2 Collab.) REFID=41004
ASTON	88	NP B296 493	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS) REFID=40262
FALVARD	88	PR D38 2706	A. Falvard <i>et al.</i>	(CLER, FRAS, LAZO+) REFID=40576
COURAU	86	NP B271 1	A. Courau <i>et al.</i>	(CLER, LALO) REFID=44510
VANBEVEREN	86	ZPHY C30 615	E. van Beveren <i>et al.</i>	(NIJM, BIEL) REFID=45769
CASON	83	PR D28 1586	N.M. Cason <i>et al.</i>	(NDAM, ANL) REFID=20752
ETKIN	82B	PR D25 1786	A. Etkin <i>et al.</i>	(BNL, CUNY, TUFTS, VAND) REFID=20390
BISWAS	81	PRL 47 1378	N.N. Biswas <i>et al.</i>	(NDAM, ANL) REFID=21106
COHEN	80	PR D22 2595	D. Cohen <i>et al.</i>	(ANL) IJP REFID=20381
MUKHIN	80	JETPL 32 601	K.N. Mukhin <i>et al.</i>	(KIAE) REFID=44528
		Translated from ZETFP 32 616.		
CORDEN	79	NP B157 250	M.J. Corden <i>et al.</i>	(BIRM, RHEL, TELA+) JP REFID=20374
ESTABROOKS	79	PR D19 2678	P. Estabrooks	(CARL) REFID=20375
FROGGATT	77	NP B129 89	C.D. Froggatt, J.L. Petersen	(GLAS, NORD) REFID=21072
PAWLICKI	77	PR D15 3196	A.J. Pawlicki <i>et al.</i>	(ANL) IJ REFID=20367
ROSSELET	77	PR D15 574	L. Rosselet <i>et al.</i>	(GEVA, SACL) REFID=11004
CASON	76	PRL 36 1485	N.M. Cason <i>et al.</i>	(NDAM, ANL) IJ REFID=21064
ESTABROOKS	75	NP B95 322	P.G. Estabrooks, A.D. Martin	(DURH) REFID=20642
HYAMS	75	NP B100 205	B.D. Hyams <i>et al.</i>	(CERN, MPIM) REFID=20355
SRINIVASAN	75	PR D12 681	V. Srinivasan <i>et al.</i>	(NDAM, ANL) REFID=21062
ESTABROOKS	74	NP B79 301	P.G. Estabrooks, A.D. Martin	(DURH) REFID=20111
GRAYER	74	NP B75 189	G. Grayer <i>et al.</i>	(CERN, MPIM) REFID=20113
APEL	73	PL 41B 542	W.D. Apel <i>et al.</i>	(KARL, PISA) REFID=44532
ESTABROOKS	73	Tallahassee	P.G. Estabrooks <i>et al.</i>	(CERN, MPIM) REFID=20345
HYAMS	73	NP B64 134	B.D. Hyams <i>et al.</i>	(CERN, MPIM) REFID=20107
OCHS	73	Thesis	W. Ochs	(MPIM, MUNI) REFID=20349
PROTOPOP...	73	PR D7 1279	S.D. Protopopescu <i>et al.</i>	(LBL) REFID=20108
BAILLON	72	PL 38B 555	P.H. Baillon <i>et al.</i>	(SLAC) REFID=20093
BASDEVANT	72	PL 41B 178	J.L. Basdevant, C.D. Froggatt, J.L. Petersen	(CERN) REFID=20095
BEIER	72B	PRL 29 511	E.W. Beier <i>et al.</i>	(PENN) REFID=44530
BENSINGER	71	PL 36B 134	J.R. Bensinger <i>et al.</i>	(WISC) REFID=21006
COLTON	71	PR D3 2028	E.P. Colton <i>et al.</i>	(LBL, FNAL, UCLA+) REFID=44533
ROY	71	PL 36B 353	S.M. Roy	REFID=51107
BATON	70	PL 33B 528	J.P. Baton, G. Laurens, J. Reignier	(SACL) REFID=20086
WALKER	67	RMP 39 695	W.D. Walker	(WISC) REFID=20960